RESPIRATORY MEDICINE (1997) **91**, 546–550

Tuberculosis in health service employees in Northern Ireland

M. RILEY*, C. M. LOUGHREY*, P. WILKINSON*, C. C. PATTERSON† AND G. VARGHESE*

*Department of Respiratory Medicine, Belfast City Hospital, Belfast, U.K
†Department of Epidemiology and Public Health, Queen's University of Belfast, Belfast, U.K.

Tuberculosis can be transmitted from patients to health care workers. However, where the incidence of tuberculosis is low, and good infection control practices exist, the risk of health care workers acquiring the disease is likely to be small. The objective of this study was to determine the rate of notification of tuberculosis in health care workers in Northern Ireland compared with the general population.

Information from the statutory tuberculosis notification forms for the period 1982–1991 was entered on to a computer database. Those patients involved in health care occupations were identified and age and sex standardized incidence rates were calculated. The overall notification rate for tuberculosis was 7·4 cases per 100 000 of general population. There was no significant increase in notification of tuberculosis among health care workers [standardized incidence ratio: 126% (95% CI 91–170)]. No cases were diagnosed as a result of screening methods performed during employment.

It was concluded that health care workers in Northern Ireland did not have a significantly increased incidence of tuberculosis compared with the general population over the 10-year period studied. This suggests that the risk of transmission from patients to health care workers is negligible in the setting of a low general incidence of tuberculosis and good infection control practice. Under these circumstances, the present findings support the cessation of routine screening of health care workers.

RESPIR. MED. (1997) **91**, 546–550

Introduction

After decades of decline, an increase in the incidence of tuberculosis has occurred in many developed countries from the mid 1980s. In the United States, this increase has been attributed to the increasing number of immigrants from endemic areas, the advent of AIDS, the emergence of multiple-drug-resistant organisms and deterioration in public health services (1). The risk to health care workers of acquiring tuberculosis has been clearly recognized for several decades, and the recent rising incidence in the general population is a cause for further concern. The literature contains many reports of outbreaks in health care settings (2). Those particularly at risk include workers involved in autopsies (3) and in situations where infectious material becomes aerosolized (4,5). Droplet nuclei formed from droplets expelled by patients are the primary source of infection (6).

Several studies in Great Britain during the 1980s have, however, failed to reveal a significantly higher incidence of tuberculosis in health care workers than in the general population (7–9). This may be due to adequate infection control measures and to the low general incidence of the disease in this country. As a result, the need for routine screening for tuberculosis of certain health care workers has been questioned (7).

Northern Ireland has a population of just over 1·5 million people. The number of immigrants from outside the British Isles is very small at 0·1% of the total population, and the population, in general, is stable, with relatively little emigration and immigration (10). Almost all health care is provided by the National Health Service (NHS) which employs about 5% of the population of working age.

Received 13 August 1996 and accepted in revised form 4 December 1996.
Correspondence should be addressed to: G. Varghese, Department of Respiratory Medicine, Belfast City Hospital, Lisburn Road, Belfast BT9 7AB, Northern Ireland, U.K.

0954-6111/97/090546+05 $12.00/0

Notification of tuberculosis remains a statutory obligation. Since 1982, the Northern Ireland tuberculosis notification form has contained a question relating to the occupation of the notifiee. In addition, information is requested on whether the patient is or has ever been employed in the NHS, and whether tuberculosis was diagnosed as a result of contact tracing or routine screening radiography. Details of sputum positivity and hospital admission are also requested. The notification form is submitted by the medical practitioner responsible for making the diagnosis.

The aim of this study was to determine the rate of notification of tuberculosis in NHS personnel and to compare it with the general population. The authors also wished to examine the role of contact tracing and screening in the identification of cases.

Methods

Information contained in all tuberculosis notification forms received by the four district health boards in Northern Ireland between 1 January 1982 and 31 December 1991 was entered on to a computer database. Records relating to notifications for chemoprophylaxis and to cases of non-tuberculous mycobacterial infection were excluded from analysis. The database was scrutinized for patients engaged at the time of notification in health care occupations and/or health service employment. Those found were further checked against the question relating to NHS employment. For patients in whom the place of employment was in doubt, further information was sought from the general practitioner or from the patient or relative.

National Health Service employment statistics were obtained for the 10 years in question. A breakdown of the numbers in the NHS workforce into eight different employment categories (see Table 1) was available for all years. In addition, an age and sex breakdown by employment category was available for the years 1990 and 1991. Assuming no significant changes in the age and sex make up of the employment categories, the breakdown in the years 1982–1989 was obtained by extrapolation from the 1990–1991 data.

The indirect method of standardization was used in order to take account of the age and sex structure of the NHS workforce. Age- and sex-specific rates were first calculated for the whole Northern Ireland population by dividing the numbers of cases occurring each year by the mid-year population estimate. These rates were used to calculate the numbers of cases expected in each NHS employment category during each year. These numbers were then summed over the 10-year period. Finally, standardized incidence ratios were calculated for each employment category and for the total NHS workforce by dividing the observed numbers of cases by the numbers of cases expected. The Poisson distribution was used to derive 95% confidence intervals.

Results

A total of 1160 cases of tuberculosis, 890 pulmonary and 270 non-pulmonary, were notified over the 10-year period under investigation. The annual incidence was not uniform and, in general, there was a progressive decline in the numbers of both pulmonary and non-pulmonary tuberculosis notifications with time (Fig. 1). A total of 83 cases (7·1%), 78 pulmonary (8·8% of pulmonary cases) and five non-pulmonary (1·9% of non-pulmonary cases), were diagnosed as a result of contact tracing procedures.

Patients (345) were hospital inpatients at the time of diagnosis or were admitted to hospital for initial treatment. Of these, 77 were positive for acid and alcohol-fast bacilli on direct examination of sputum.

Forty-two patients were identified as NHS employees at the time of diagnosis (Table 1). Of these, 28 had pulmonary and 14 had non-pulmonary tuberculosis. The expected numbers of cases and the standardized incidence ratios are also shown. The overall rate of tuberculosis in NHS employees was not significantly increased compared with the rate in the general population [standardized incidence ratio 126% (95% CI 91–170)]. More specifically, there was no significant increase in the incidence of pulmonary tuberculosis. None of the individual occupational groups had a significantly increased rate of either pulmonary or non-pulmonary tuberculosis compared with the general population.

All the health care workers with tuberculosis were born in the British Isles apart from four of the six cases in the medical and dental category, who had immigrated from the Indian sub-continent 4·5–15 years prior to notification. Two of these patients had pulmonary and two had non-pulmonary tuberculosis. No mortuary workers were notified with tuberculosis.

One nurse was diagnosed by routine pre-employment chest X-ray. No cases in NHS employees were detected by routine chest X-ray screening during employment. Two nurses and one ancillary worker were detected by contact tracing, but the index case was a family member in each instance. No cases were identified by screening employees exposed to a tuberculosis patient encountered at work.

TABLE 1. Notification of tuberculosis (TB) in National Health Service employees

Employment group	Person years	Pulmonary TB			Non-pulmonary TB		
		Cases notified (*n*)	Expected number of cases (E)	Standardized incidence ratio (%)*	Cases notified (*n*)	Expected number of cases (E)	Standardized incidence ratio (%)*
Administration & clerical	67 370	2	2·8	72	1	1·1	88
Works & maintenance	9570	1	0·8	118	2	0·2	1155
Ancillary & general	120 033	6	5·9	102	2	2·4	83
Nursing & midwifery	208 784	11	8·4	131	4	3·6	112
Professional & technical	35 954	3	1·7	172	2	0·6	345
Medical & dental	27 033	3	1·7	176	3	0·4	680
Ambulance	5857	1	0·4	279	0	0·1	0
Social services	47 055	1	2·2	45	0	0·9	0
Total	521 656	28	24·0	117 (95% CI: 78–169)	14	9·4	149 (95% CI: 81–250)

*Standardized incidence ratio = $100 \times n/E$.

The expected number is standardized for age and sex. Ancillary & general category includes porters, cleaners and catering staff. Professional & technical includes physiotherapists, occupational therapists, pharmacists, laboratory and mortuary staff. No significant increases in pulmonary or non-pulmonary tuberculosis were found in any group (see text).

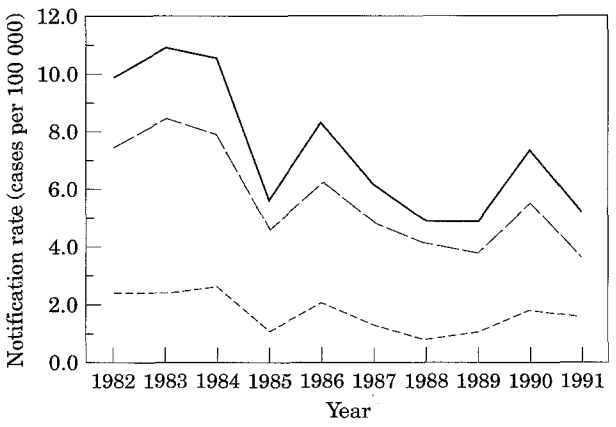

FIG. 1. Notification rates for pulmonary (— — —) non-pulmonary (-----) and total (———) cases of tuberculosis in Northern Ireland for the period 1982–1991.

In addition to the 42 workers employed in the NHS at the time of diagnosis, a further 26 cases were identified as previous NHS employees. Of these, 22 had left the service more than 2 years before the date of notification of their disease.

Discussion

It is concluded that NHS employees in Northern Ireland did not experience a significantly increased incidence of tuberculosis compared with the general population over the 10-year period 1982–1991. This supports previous work in Great Britain over the last 20 years which has failed to find a significant increase in tuberculosis among NHS employees (7,8) or laboratory workers (9,11). The findings are in contrast to studies covering earlier periods both in Britain and elsewhere showing increased risk among physicians (12), nurses (13) and laboratory workers (14). Additionally, no apparent increase in tuberculosis was found among medical, nursing and laboratory staff, the sub-groups often considered at highest risk (7). It is possible that the authors could have missed an increased incidence of tuberculosis in a small subgroup of NHS employees at very high risk of infection, but data to allow further subdivision of the occupation groups into those at high and low risk was not available. Standardized incidence ratios in NHS employees were similar for both pulmonary and non-pulmonary tuberculosis. Overall, the results suggest that infection-control procedures in use during the period covered by this study (15) were, at the very least, adequate for the risks posed by tuberculosis patients to health care workers.

There is a possibility that some patients with tuberculosis were not recognized as current NHS employees. The authors tried to account for this by scrutinizing the database for both health care occupations and for present or previous NHS employment. Where discrepancies arose, further clarification was sought. The occupational history may have been incorrectly noted on the notification form, but it seems more likely that there would have been a bias in favour of reporting health care occupations because of the perceived increased risk experienced by this group. The disease may have been responsible for termination of employment in the NHS before diagnosis, but again it seems likely that this situation would have been recognized and reported by the medical practitioner. Another minor limitation to the study is the so-called 'healthy worker effect', where those in employment may have less disease than their contemporaries who are not working (16). This could result in a slight overestimation of the expected numbers of cases in the NHS workforce, and a consequent underestimation of the standardized incidence ratios.

Overt tuberculosis ensues after a variable latency period following acquisition of the infection. The authors were not able to account for previous health care workers who developed tuberculosis after leaving the NHS, but who may have been infected while they were NHS employees. Since most of the previous NHS employees identified had left at least 2 years prior to notification, a link between their disease and health care employment would be difficult to prove.

No cases of tuberculosis were diagnosed among NHS employees using routine screening methods during employment, either by annual chest radiography or specific contact tracing of those involved in the care of patients with tuberculosis. During the period covered by the study, guidelines similar to the 1983 British Thoracic Society recommendations (15) were followed with annual chest X-rays offered to ward staff in regular contact with tuberculosis patients and to laboratory workers routinely handling tuberculosis specimens. The failure to pick up cases from screening of NHS employees supports the view that this practice is not cost-effective and exposes staff to unnecessary carcinogenic risk. Lunn and Mayho (7) found a very low yield from annual chest radiography in their study of health care workers in England and Wales. Other work in the U.S.A. has also indicated the limited usefulness of routine repeat X-rays in detection of pulmonary tuberculosis (17–19), and it has been suggested that emphasis be placed, instead, on full investigations of those who develop respiratory symptoms.

It is concluded that health care workers in Northern Ireland do not run a significantly increased risk of tuberculosis compared with the general population. No cases were identified using routine screening methods during employment, and this finding supports current recommendations that these practices are no longer necessary (20), at least where the general incidence of tuberculosis is low.

Acknowledgements

The authors wish to thank Miss E. McConnell and Mrs S. Morrison for help in construction of the computer database. The authors are also indebted to the staff of the Analytical Support Branch of the Northern Ireland Department of Health & Social Services for providing the age and employment breakdown of the NHS workforce.

References

1. Bloom BR. Back to a frightening future. *Nature* 1992; **358:** 538–539.
2. Markowitz SB. Epidemiology of tuberculosis among health care workers. *Occup Med* 1994; **9:** 589–608.
3. Lundgren R, Norrman E, Asberg I. Tuberculosis infection transmitted at autopsy. *Tubercle* 1987; **68:** 147–150.
4. Hutton MD, Stead WW, Cauthen GM *et al.* Nosocomial transmission of tuberculosis associated with a draining abscess. *J Infect Dis* 1990; **161:** 286–295.
5. Cantanzaro A. Nosocomial tuberculosis. *Am Rev Respir Dis* 1982; **125:** 559–562.
6. Wells WF. On airborne infection. Study II. Droplets and droplet nuclei. *Am J Hyg* 1934; **20;** 611–618.
7. Lunn JA, Mayho V. Incidence of pulmonary tuberculosis by occupation of hospital employees in the National Health Service in England & Wales 1980–84. *J Soc Occup Med* 1989; **39:** 30–32.
8. Capewell S, Leaker AR, Leitch AG. Pulmonary tuberculosis in health service staff – is it still a problem? *Tubercle* 1988; **69:** 113–118.
9. Grist NR. Hepatitis and other infections in clinical laboratory staff, 1979. *J Clin Pathol* 1981; **34:** 655–658.
10. Church J, ed. Regional Trends 30. London HMSO, 1995, p. 49.
11. Grist NR, Emslie JAN. Infections in British clinical laboratories. *J Clin Pathol* 1991; **44:** 667–669.
12. Geiseler PJ, Nelson KE, Crispen RG *et al.* Tuberculosis in physicians: a continuing problem. *Am Rev Respir Dis* 1986; **133:** 773–778.
13. Burrill D, Enarson DA, Allen EA, Grzybowski S. Tuberculosis in female nurses in British Columbia: implications for control programs. *Can Med Assoc J* 1985; **132:** 137–140.
14. Harrington JM, Shannon HS. Incidence of tuberculosis, hepatitis, brucellosis and shigellosis in British medical laboratory workers. *BMJ* 1976; **i:** 759–762.
15. Joint Tuberculosis Committee of the British Thoracic Society, Control and prevention of tuberculosis: a code of practice. *BMJ* 1983; **287:** 1118–1121.
16. Reid DD. Incidence of tuberculosis among workers in medical laboratories. *BMJ* 1957; **2:** 10–14.
17. Craven RB, Wenzel RP, Atuk NO. Minimising tuberculosis risk to hospital personnel and students exposed to unsuspected disease. *Ann Intern Med* 1975; **82:** 628–632.
18. Barret-Connor E. The epidemiology of tuberculosis in physicians. *J Am Med Assoc* 1979; **241:** 33–38.
19. Menzies D, Fanning A, Yuan L *et al.* Tuberculosis among health care workers. *N Engl J Med* 1995; **332:** 92–98.
20. Subcommittee of the Joint Tuberculosis Committee of the British Thoracic Society. Control and prevention of tuberculosis in Britain: an updated code of practice. *BMJ* 1990; **300:** 995–999.